

## Community Technology Fund 2001

### Nebraska Information Technology Commission Community Technology Fund 2001

#### Application Form

#### Section I: General Information

**A. Project Title:** Creating a Common Framework for Integrating Surface Water Data

**Name of Submitting Entity:** Lower Platte North Natural Resources District

**Project Contact Information:**

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#### B. Certification for Request

I certify that to the best of my knowledge the information in this application is correct and that the application has been authorized by this entity to meet the obligations set forth in this application.

Authorized Signature: \_\_\_\_\_

Typed Name: John Miyoshi

Title: Manager

Name of Entity: Lower Platte North Natural Resources District

Date: 2/16/01

Total State Funds Requested: \$ 24,800

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## **Section II: Executive Summary**

This project will develop a standardized, surface water features database (map), to facilitate the collection and integration of data and public policies of multiple state, local, and federal agencies that make or implement public policies related to Nebraska's surface water. Specifically, this project will develop a digital, (1:24,000-scale) geospatial database (map), with associated attributes, for the surface water features in the Salt Creek Watershed in eastern Nebraska (Lancaster/Saunders County). This geospatial database will be based on a model, which has been endorsed by the Nebraska GIS Steering Committee and which was specifically designed to provide a common reference, surface water database to facilitate multipurpose use and inter-agency collaboration.

The project will convert existing paper maps to digital geospatial format, update the stream locations from these 1950-60s vintage paper maps based on modern aerial photography, and provide standardized database identifiers for all surface water features. The project will facilitate the collaborative use of modern information technology, such as geographic information systems (GIS), in the important public policy area of surface water by developing a standardized database for this one geographic area. The project will make information more accessible to the general public by facilitating the use of information technology tools, such as GIS, to graphically display the implications of public policies and issues related to surface water. The project will be a collaborative effort undertaken by the Lower Platte North Natural Resources District, the Department of Natural Resources and the Conservation and Survey Division of the University of Nebraska.

## **Section III: Goals and Objectives**

1. Describe the project, including the specific goals and objectives.
  - a. Enhance the ability of communities, local governments and other entities to incorporate issues related to surface water into public policy and infrastructure planning considerations by more clearly communicating these issues to policy makers and the general public through current, high-resolution digital maps.
  - b. Develop a digital map of surface water features (streams, lakes, etc.) at a map scale of 1:24:000 (spatial accuracy of  $\pm 40$  ft.) for this specific watershed and the communities in this area.
  - c. Revise and update existing maps to reflect changes in the shape and location of surface water features (stream channels, lakes, etc.) from 1950-60s vintage data to current locations provided by 1993-99 aerial photography.
  - d. Enhance public policy development and implementation by facilitating interagency data integration and exchange through standardized identifiers provided as associated attributes for all surface water features (stream segments, lakes, etc.).
  - e. Facilitate the collaborative public/private use and implementation of modern information technologies, such GIS, by cooperative development of a standardized

database that provides a common data infrastructure for numerous applications.

- f. Promote the collaborative development of priority geospatial databases by building on an intergovernmental pilot project and adopting database standards endorsed by the Nebraska GIS Steering Committee and by demonstrating an organizational model for such collaborative development.

2. Describe the project's relationship to the entity's comprehensive technology plan.

The Lower Platte North Natural Resources District (LPNNRD) is committed to leveraging the power of information technology to pursue its charge of managing and conserving the natural resources in its geographic area of responsibility. For the last several years, the development of GIS capabilities have been a major focus of LPNNRD's technology plan. LPNNRD is working with other NRDs in the surrounding area to develop a regional GIS center (based at LPNNRD) to support GIS natural resource applications for LPNNRD and other NRDs in the area. As this regional GIS center develops, it is also hoped that arrangements can be made to offer these services to other interested local government entities. Toward this end, the LPNNRD has purchased the hardware, software (ArcIMS), and hired the technical personnel to make these services available via the Internet.

A key component of any GIS is the geospatial data (smart digital maps) of the features to be incorporated into any GIS analysis. LPNNRD has worked with the Nebraska GIS Steering Committee and other agencies to support the development of many of these databases (soils, aerial photography, elevation data, roads, etc.). Surface water is one of the major areas of responsibility for LPNNRD. Consequently, the absence of a comprehensive, current, high-resolution surface water features database is a major missing piece in LPNNRD's plans to develop a regional GIS center and to apply this technology to natural resources management. This LPNNRD proposal to develop this model surface water features database for one watershed in its area will be a major step in addressing this particular need identified in its technology plan. This effort will help lay the foundation for developing this database for the other watersheds in this general area and will support the broader technology plan endorsed by the Nebraska GIS Steering Committee, which calls for the statewide development of a surface water database based on this model.

3. Describe the project's objectives and how they support the goals of the NITC and the priorities of the Community Council. The goals and priorities are listed in the Community Technology Fund Guidelines. You may refer to the goals and priorities using their alphanumeric designation (e.g. NITC-1, CC-1).
  - a. The coordinated development of this standard reference database will improve government efficiency and effectiveness as outlined in NITC-1 by providing the data infrastructure necessary to apply the power of GIS to surface water related public policy development and implementation and by greatly facilitating interagency and

intergovernmental data sharing and integration through the use of standardized identifiers for all surface water features.

- b. NITC-3 speaks to the importance of a broad strategy and objectives for developing and sustaining information technology in Nebraska. The Nebraska GIS Steering Committee has prioritized the statewide development of this surface water database because it is one of a select few databases that provide the underlining framework for coordinated GIS development and widespread data sharing and integration.
- c. CC-2 speaks to the importance of promoting the development of an infrastructure that is secure, affordable, reliable, responsive to the specific needs of various sectors, and compatible across the state. It is only through the cooperative development of such a standardized surface water database that this comprehensive, accurate, and current data on Nebraska's surface water can be made widely available. The project is based on a state/national endorsed data model, and will thereby serve to further promote statewide compatibility.
- d. CC-4 speaks to the importance of facilitating IT development through sharing information, encouraging collaboration, and developing partnerships. All of these characteristics are inherent in this project of developing a standardized surface water database. A major objective of the project is the facilitation of surface water related data sharing, integration and collaboration. The database is to be designed around standards endorsed by the Nebraska GIS Steering Committee. The organizational model of the project is based on partnerships.

#### **Section IV: Scope and Objectives**

Describe the project's specific scope and objectives. The narrative should address the following:

1. Beneficiaries of this project and the need(s) being addressed.
  - a. The Lower Platte North Natural Resources District (LPNNRD), the Lower Platte South Natural Resources District (LPSNRD) and the communities and citizens in its service area will be the primary beneficiaries of this project. Surface water is one of the major natural resources that NRDs are statutorily charged with managing. Other areas for which NRDs also has responsibility are also impacted by surface water related issues, such as: flooding, soil erosion, recreation, and groundwater. LPNNRD and LPSNRD have determined that GIS provides powerful information management tools to assist in the management of these resources and has already made significant investments in the implementation of this technology. This surface water database will provide a core piece of the data infrastructure needed to apply this technology to multiple surface water related issues. Some example of specific LPNNRD needs and uses include: modeling conjunctive use of water by Omaha's MUD and the Lincoln Water System for large surface water permit applications; Source Water Protection Area (SWPA) designation and delineation; establishment of Total Maximum Daily

Loads (TMDLs) and their relationships to non-point source pollution sources; licensing of livestock waste facilities; identification and location of alluvial wells; and identification and mapping of buffer strip areas.

- b. As part of a needs assessment conducted by the Nebraska GIS Steering Committee, a wide range of other public agencies indicated that they have a need for this type of data and would use a standardized surface water database if it were available. Among the likely applications listed in a recent GIS Strategic Plan adopted by the Nebraska GIS Steering Committee are the following:

Nebraska Dept. of Natural Resources: floodplain mapping, water rights delineation, dam safety, and groundwater wells/surface water interaction.

Central Platte NRD: standard reference for surface water sample locations, and drainage basin characteristics

Nebraska Game and Parks Commission: enhanced stream information for fisheries management and wildlife management and protection, enhanced lake information for recreation areas and wildlife management

Nebraska Dept. of Environmental Quality: standardized stream segment delineation and identification, surface water quality enforcement, and total maximum daily load and waste load allocation permits

Nebraska Dept. of Roads: hydrologic modeling related to bridge design

Nebraska Dept of Agriculture: devising and overseeing implementation of a statewide vegetative buffer strip plan around surface water features.

- c. The ultimate beneficiary of most of these applications are citizens who benefit from these widely varied public programs that would be facilitated by the availability of this standardized, current database on Nebraska surface water features. These citizens will receive further benefits from the increased likelihood of inter-program coordination due to these multiple programs using a common surface water database.

## 2. Expected outcomes of the project;

- a. Development a digital map of surface water features (streams, lakes, etc.) at a map scale of 1:24:000 (spatial accuracy of  $\pm 40$  ft.) for this specific watershed and the communities in this area.
- b. Revision and updating existing source maps to reflect changes in the shape and location of the surface water features (stream channels, lakes, etc.) from 1950-60s vintage data to current locations provided by 1993-99 aerial photography.
- c. Implement standardized identifiers for surface water features (stream segments, lakes, etc.), based on EPA River Reach Coding, by providing identifiers as attributes associated with all surface water features in the database. As these standard

identifiers are adopted, they will enable links between the GIS and existing surface water databases and between multiple agencies' databases.

- d. Promote the collaborative development of statewide priority geospatial databases by building on an intergovernmental pilot project and adopting database standards endorsed by the Nebraska GIS Steering Committee and by demonstrating an organizational model for such collaborative development.
3. Measurement and assessment methods that will verify project outcomes;
    - a. The proposed surface water database is based on a database model (National Hydrography Dataset, NHD) jointly developed by the US Geological Survey and the US Environmental Protection Agency. In developing this model, they also developed software tools to assist in its development and to test its operability. These tools will be used to develop and test the final database.
    - b. The database will be submitted to the USGS for final review, quality control and for approval of both the digital line work and the standardized identifier attribute coding.
  4. Significant constraints of the project (Constraints are factors that will limit the project management team's options.);
    - a. Database Model. The overall characteristics and methods of representing the surface water features have been defined in a database model (National Hydrography Dataset, NHD) jointly developed by USGS and EPA for a 1:100,000 scale NHD. This model will guide (constrain) the development of a higher resolution (1:24,000 scale) NHD database. The software tools designed to facilitate the transfer (conflation) of attribute data from the 1:100,000 digital line work to the 1:24,000 digital line work will require a fairly high level of conformity to the database standards.
    - b. State Guidelines. Within the constraints of the NHD database model, there is still a fair degree of flexibility possible in terms of the number and extent of surface water features that will be digitally captured and the level of spatial revision desired for a temporal update. In the course of an interagency NHD pilot project, the cooperating agencies have further defined guidelines for these database parameters and this project will follow those guidelines.
    - c. Digitizing. Probably the most challenging constraint in this project is the difficulty of hiring, retaining, and supervising personnel to do the tedious work of accurately hand-digitizing (tracing on a computer screen) the path of streams and the outline of lakes and other surface water features. While not technically difficult, this work can be very tedious and it becomes difficult to continue and maintain quality output after several hours of continuous work. For this reason, it may be necessary to employ several people, on a part time basis, to digitize the approximately 4,000 miles of streams, stream banks, and lakes in this watershed. Training, retaining and supervising these part time workers in a manner that will produce a reasonably consistent and quality product will also be a challenge.

5. Significant assumptions relating to the project (Assumptions are factors that, for planning purposes, will be considered to be true.).
  - a. One key assumption is that the NHD experience and expertise gain by a few key personnel in the Nebraska Dept. of Natural Resources, as part of an initial NHD pilot project, will be available to assist LPNNRD personnel throughout this project.
  - b. The active support of the Conservation and Survey Division of UNL to support the process of employing part-time students to do the actual hand digitizing work is another key assumption.
  - c. Another key assumption is that the USGS will be willing to assist/partner in this endeavor in a manner to provide technical assistance and quality assessment and control of the final product.

## **Section V: Project Justification (Business Case)**

Justify the project either in terms of an economic return on investment or other benefits to the entity or the public. The narrative should address the following:

1. Cost/benefit analysis and a life cycle cost analysis;

Available resources and time do not permit a detailed cost/benefit analysis of this project. However, a GIS Strategic Plan recently adopted by the Nebraska GIS Steering Committee reported on a 1998 cost/benefit analysis of GIS implementation in state and local governments in Montana. That analysis of 10 case studies (4 local government and 6 state government) ...*"predicted benefit/cost ratios ranging from 1.2 - 5.6 for case studies producing effectiveness benefits. In other words for every dollar spent on running a GIS application the return on investment ranged from \$1.20 to \$5.60."* While one can not directly generalize from that study to this specific project, that study does speak to a general cost effectiveness of GIS that has been shown over multiple state and local government applications.

As has been noted previously in this application, a major portion of the LPNNRD's work involves issues directly and indirectly related to surface water. The LPNNRD has already made a significant investment in GIS technology and has entered into agreements with other NRDs in its general area to develop a regional GIS service capability. The development of an accurate, comprehensive, and current digital map of the surface water features in this watershed area will provide them with a key component of the needed data infrastructure to apply this technology investment to surface water-related issues. This project will also lay the technical and organizational foundation for the development of similar surface water databases for the other watersheds in this general area.

It is likely that the greatest cost/benefit from this project will be realized by the fact that once this geospatial database has been created, multiple state, local and federal agencies will commence to use it as a common reference database for numerous applications and data collection activities. When these multiple agencies adopt this database, they will

also adopt the standardized identifiers for surface water features built into the database structure. This will then lay the foundation for integrating a wide variety of agency databases related to surface water.

The life cycle cost of this project involves an almost exclusively a one-time, up-front investment in data development. Once the initial investment to develop this database has been made, it will require very little investment to maintain the database over a very long period of time (30-40 years). Because the database is digital, any changes in a particular stream location or shape can be easily modified and distributed. In the meantime, wide spread benefits will accrue through the wide spread use of this standardized database and the associated database standards that facilitate data integration.

2. Impact the project will have on the customers, clients, and citizens. What services or processes will be changed or implemented, with respect to customer service, productivity, quality, or performance;

The availability of this standardized, high-resolution surface water features database will enable the LPNNRD and other users to apply the spatial analytical tools of GIS to public policy and management issues related to surface water. This database, in combination with the graphical capabilities of GIS, will also allow LPNNRD, and other users, to graphically display issues related to surface water public policy and management and thereby facilitate communication related to these issues with specific landowners and the general public and facilitate their understand and input. For example, this database would helpful in signing farmers up for the Nebraska Buffer Strip program. With good mapping this becomes a simple procedure as stream centerlines set the eligibility parameters for the program. Also, this database used in conjunction spatial databases related to soils, surface elevation, land use and riparian buffer strips could be used to model and display the relative tendency for soil erosion and/or stream or lake waste loading in a given area. As multiple agencies adopt the standardized identifiers for surface water features built into this database, this database will also facilitate the integration of surface water data across multiple agencies and support more consistent and integrated management and public policy decisions. As an example, agencies such as NDEQ, NGPC, USGS and NRDs collect water samples from a wide variety of stream segments for a variety of programs. Common stream segment identifiers will facilitate the integration of this data across agency and program lines. Other example applications are delineated in Section IV.1.

3. Impact the new system will have on current problems and how it will impact the entity's policies, procedures, standards, staffing, costs, and funding;

As noted above, the current absence of widely adopted standardized identifiers for stream segments make it practically very difficult to integrated data collected across agency or program lines. It is anticipated that the standardized identifiers incorporated in this database will become widely adopted over a period of time. This will then allow agencies to base their public policy and management decisions on a wider pool of integrated data and thereby promote more consistency across agencies. Presently the low



level of spatial accuracy, and/or the relative incompleteness of available surface water geospatial databases forces unsatisfactory choices upon users of surface water data. They can use the more accurate and comprehensive paper maps that are currently available and forgo the power and speed of digital geospatial analysis. Or they use the available digital maps, which in most cases are either incomplete or of low-resolution, such that users must struggle with the problems of missing or inaccurately placed stream segments. The use of these incomplete and inaccurate digital maps result in such problems as waters wells showing up on the wrong side of streams or data collected on stream segments not represented on the digital map. These examples illustrate some of the credibility problems that can easily occur when one attempts to use these inadequate digital maps and how they hinder the full utilization of the power of GIS. Beyond these general impacts, specific examples include the daily need for field boundaries for Conservation Plans. Stream placement is critical to automate this process. The District is also continually GPSing water well locations to enhance our current database. Again accurate stream placement is critical to assist with proper well location. Other example applications and benefits are outlined in Section IV.1 and point 2 of this section.

4. Other solutions that were evaluated and why they were rejected. Include their strengths and weaknesses. Explain the implications of doing nothing and why this option is not acceptable;

An interagency Water Resources Database Advisory Committee convened on behalf of the Nebraska GIS Steering Committee considered the need for and alternatives to realize water-related databases. After identifying 26 needed water-related databases, this Advisory Committee prioritized the surface water features database as the highest priority for development. Four alternative solutions or approaches were considered relative to addressing the need for a digital, geospatial, surface water features database.

Do Nothing. It was recognized that most state and local surface water data collection, public policy development and management efforts are currently based on 1:24,000 scale USGS 7.5 minutes paper topographical maps. A digital geospatial replication of these maps does not currently exist for most of Nebraska. Because of the power and efficiency of GIS, it was widely expected that absent the development of a comprehensive, standardized, hydrographic geospatial database, that multiple agencies would likely develop their own unique hydrographic databases to serve their particular agency needs for specific areas of Nebraska. It was expected that this approach would result in a wide spread, costly duplication of effort. It was also expected that this approach would result in non-standard hydrographic databases that would be very difficult to integrate over the same or adjoining geographic areas. Such a non-coordinated developmental approach would likely be more costly and would result in data that could not be easily shared or integrated.

1:100,000 Scale NHD. The USGS and EPA jointly developed a database model and a nationwide 1:100,000-scale National Hydrography Dataset (NHD). This database was evaluated by the Advisory Committee and found to be lacking for many applications. The Advisory Committee found that many of the special features incorporated in the

NHD database model were well-designed to serve the multipurpose needs of a wide cross-section of users. However the Advisory Committee concluded that the low-resolution of a 1:100,000-scale database was not appropriate for many state and local applications. A 1:100,000-scale database has a spatial accuracy of  $\pm 167$  ft. and the Advisory Committee felt that a 1:24,000 scale ( $\pm 40$  ft.) database was more appropriate for most state and local applications. It was also noted that in the highly generalized 1:100,000-scale database many stream segments and smaller tributaries were not represented.

Existing 1:24,000 Scale Database. Several years ago the Nebraska Natural Resources Commission developed a digital 1:24,000-scale hydrographic database as part of its effort to delineate watershed basins. For the purposes of this project, the NNRC captured only the major stream in each watershed area. The Advisory Committee evaluated this database for its suitability to serve as a general surface water features database for Nebraska. While this database was at the desired map scale, the Advisory Committee found it to be lacking in several key areas. Because the initial intent was to only capture the major stream in each watershed, numerous stream segments of interest to many agencies were not represented. This existing database only captured the stream centerline and therefore didn't include the stream banks or lakes that are represented on the 7.5-minute topographical maps. This database also did not include any standardized identifier attributes for stream segments to facilitate data sharing and integration. Samples of this database were given to USGS to evaluate as a potential starting point for the development of a 1:24,000-scale NHD and USGS determined that it would not be cost-effective to attempt to develop an NHD database based upon this existing 1:24,000-scale database.

1:24,000 NHD. The Advisory Committee recommended that best long-term solution would be the cooperative development of a 1:24,000-scale NHD. This database would be based on the multipurpose database model developed for the 1:100,000 NHD, which incorporates several special features, designed to facilitate its multipurpose use. The Advisory Committee concluded that the combination of these database features with a 1:24,000 scale digital map would provide a hydrographic database that would serve the needs of a wide variety of state and local applications. As such, once this database was developed it would likely be widely adopted and the standards incorporated in the database would facilitate wider data sharing and integration. The Advisory Committee recommended the statewide development of this hydrographic database model and the Nebraska GIS Steering Committee adopted this recommendation and included it in its Nebraska GIS Strategic Plan of September 2000.

5. The project's compliance with any state or federal mandates. If yes, please specify the mandate being addressed.

There are no known specific state or federal mandates that directly relate to this project. However, as noted in response to question 4 above, the hydrographic database model proposed for this project is consistent with the database model recommended for statewide development by the Nebraska GIS Steering Committee. Both the Nebraska GIS

Steering Committee and the Federal Geographic Data Committee have placed a priority on the development of a standardized geospatial hydrographic database to serve as common data infrastructure for a wide variety of applications. This project is seen as an important step in an effort to support statewide development of such a standardized database.

## **Section VI: Implementation**

Describe the implementation plan--from design through installation and ongoing support--for the project. The narrative should address the following:

1. Project sponsor(s) and stakeholder acceptance analysis;

As outlined in section IV-b, a needs assessment conducted by the Nebraska GIS Steering Committee determined that a wide range of public agencies need and would use a high-resolution, standardized surface water database if it were available. As outlined in section V-4, and interagency Database Advisory Committee, convened in response to this needs assessment, explored several alternatives to address this need and recommended statewide development of a standardized surface water features database based on the model incorporated in this proposed project. Attached to this proposal are letters from both the Department of Natural Resources and the Conservation and Survey Division - UNL expressing their support for this proposal and committing their agencies to work cooperative with the project sponsor, Lower Platte North NRD, to develop this standardized database for one specific watershed. Also attached are letters of support from several other state and local agencies that have an interest in utilizing this standardized hydrographic database for this particular watershed.

2. Define the roles, responsibilities, and required experience of the project team;

The project sponsor and agency responsible for overall management of the project is the Lower Platte North NRD. Cooperating partners in this endeavor will be the Department of Natural Resources (DNR) and the Conservation and Survey Division - UNL. A high proportion of the total work hours required for this project involve the hand digitizing of stream and bank locations from digital aerial photography. While this work requires a reasonable level of familiarity with stream networks and computers, it does not require a particularly high level of technical expertise. One element of this proposal involves exploring the feasibility of utilizing college students to do this time consuming hand digitizing work. It is hoped that college students, particularly those interested in natural resource issues, can provide a cost-effective pool of reasonably skilled part-time digitizers. This project will work with the Conservation and Survey Division (CSD) to recruit and hire part-time student intern(s) or graduate student(s) to do this hand digitizing for the Salt Creek Watershed and explore the feasibility of this approach for a potential statewide effort.

The technical expertise for the project will be provide by the staff of the Department of Natural Resources based on the experience they have gain through an earlier NHD pilot project in another northeast Nebraska watershed. This staff has developed a familiarity

with the NHD database model and the particular tools designed to develop and test the database. This technical staff will work with CSD to recruit and hire student digitizers and will provide the training and day-to-day oversight of these student digitizers. It is anticipated that DNR will also provide the workspace for these students. DNR technical staff will also be responsible for completing the final specialized work of incorporating the special NHD attribute features into the database (conflation/post-conflation).

If this proposal is funded, it is anticipated that arrangements will be made with the US Geological Survey to conduct quality assurance and control procedures on the final product.

This overall project is designed with the dual purpose of 1) developing this needed database for one particular watershed and 2) to test proposed procedures, tools and organizational arrangements for the cooperative development of this database on a statewide basis.

3. List the major milestones and deliverables for each milestone;

- a. Develop specialized software tools for students to use to digitize and do initial attribution of surface water features. (*1<sup>st</sup> month*)
- b. Hire and train (1-2) students to do digitizing (*1-4 months depending on grant fund availability timeline relative to student worker availability during fixed summer and/or semester timelines*)
- c. Complete digitization of surface water features in Salt Creek Watershed area (*3-5 months from initial hiring depending on student availability*)
- d. Conflation/post-conflation — final specialized work of incorporating and checking the special NHD attribute features into the digitized database developed by the students (*1-2 months following completion of digitizing*)
- e. Quality assurance and control — USGS conduct quality assurance and control of the final product (*completion of final USGS review uncertain because of current backlog at USGS*)

Note. A major variable for milestone timelines for this project relate to the available of student workers and their fixed work periods (semesters and summers) relative to grant fund available. However, even given this unknown, it is expected that the project can be completed within a year's timeline.

4. Training and staff development requirements and procedures;

The primary training and staff development needs will be related to training the anticipated student digitizers to use the specialized digitizing tools and to developing a basic understanding of the NHD database model and stream tributary relationships. Depending upon their previous experience, limited training may also be necessary in ArcView GIS software. DNR technical staff will continue to work with USGS NHD

specialists to enhance their understanding of the specialized NHD development tools. During the course of this project efforts will also be made to expand this base of NHD technical expertise to one or more additional DNR staff members to minimize the impact of potential staff turnover.

5. Maintenance and on-going support requirements, plans and provisions.

It is not anticipated that there will be a heavy maintenance burden for this database. However, stream channels do change over time, and as they change it will be desirable to revise the database. Long-term maintenance provisions for this dataset are still under discussion, as plans for the statewide development of this dataset are still evolving. It is likely, at this point, that the primary maintenance responsibility will rest with the Department of Natural Resources, with local agencies such as the NRDs and local governments playing a leading role in identifying when a given database needs revision. At this point it is anticipated that this database will be available online from both the Lower Platte North NRD and the Department of Natural Resources. Parallel efforts are under discussion and are anticipated, by agencies interested in this dataset, to develop specific example applications to demonstrate the various features and capabilities built into the dataset.

## **Section VII: Technical Impact**

Describe how the project enhances, changes or replaces present technology systems, or if new systems are being added. The narrative should address the following:

1. Describe the hardware, software, and communications requirements for this project. Describe the strength and weaknesses of the proposed solution;

We anticipate that the project will require the use of one GIS-capable workstation with an Arc/Info license for each FTE assigned to digitizing. This workstation will require Office2000. An existing workstation will be used for the technical-management component of the project, which has an Arc/Info license. It is anticipated that a GRID license and a NETWORK license will be necessary for post-digitizing processing. The existing workstation has access to a floating NETWORK license.

2. Rationale for determining the selection and appropriateness of the proposed technology components compared to the needs of the users;

Relative to software choices, NHD development was designed on and for systems using Arc/Info-ArcView GIS software. All modifications to the existing process have been implemented on Arc/Info-ArcView as well. I am not aware of another GIS software that will support these NHD development programs.

Relative to the database model/structure, Section V.4. outlines the rationale and process for selecting the NHD database model as opposed to others that were considered.

3. Issues pertaining to reliability, security and scalability (future needs for growth or

adaptation);

Implementation of the NHD process is, from a time standpoint, dictated to a large extent by digitizing. NHD could be developed faster with additional digitizing capacity. Digitizing capacity could be increased by acquiring additional GIS workstations configured like the one described in section 1 for each additional FTE.

The NHD database model itself is designed to allow for further enhancement through increased spatial accuracy and stream network detail.

4. Appropriateness of the key technologies with respect to generally accepted industry standards.

Arc/Info and the related ESRI family of Arc software products are a very widely used GIS industry standard. Because of its wide spread use, most GIS software has at least a limited capability to import Arc files.

The NHD database model itself is a national standard for capturing hydrographic data and has been endorsed by the Nebraska GIS Steering Committee and the Federal Geographic Data Committee.

5. Compatibility with existing institutional and/or statewide infrastructure.

NHD is developed in Arc/Info and uses Arc/Info objects to define routes and regions to identify components of the database. This results in a somewhat platform-specific database. Arc/Info is an industry standard. In Nebraska, it is likely that most users are using an Arc or Arc compatible software. The major exception to this is the Nebraska Department of Roads, whose main GIS software is Intergraph. However, NDOR also has Arc/Info software. It is likely that most GIS systems will be able to import and use the digital line work of the NHD database, but some may be limited in their ability to utilize some of the higher-end, built-in attribute features. Further application development will be needed to explore the specific impact of built-in Arc features relative to their availability to other GIS software.

## **Section VIII: Risk Assessment**

Describe possible barriers and risks with implementing the project. The Narrative should address the following:

1. Describe the risk assessment which has been performed on this project;

A risk assessment of this project was conducted by an interagency working group that was been involved in the development of this proposal and the development and implementation of an early Nebraska NHD pilot project. Areas of potential risk were identified based on previous experience and the new aspects that were incorporated in this particular project design. Possible mitigating actions for each of the identified risks were outlined.

2. List the identified risks, and relative importance of each (*listed in order of anticipated level of risk*);
  - a. Difficulty of recruiting and maintaining quality student digitizers;
  - b. Maintaining a consistent, high-quality digitized product;
  - c. Loss of technical staff expertise/experience gained in previous NHD pilot project;
  - d. Complications related to multiple project partners;
  - e. From scratch digitizing versus editing; and
  - f. Unanticipated conflation/post-conflation process step complications.
3. Identify strategies which have been developed to minimize risks;
  - a. Difficulty of recruiting and maintaining quality student digitizers — There is a limited pool of college students who might be interested and qualified for this type of digitizing work. It is not particularly technically demanding, but it is tedious and requires a commitment to high quality. To minimize the potential impact of these risks, the project has budgeted student personnel costs at the upper end of the current University student pay scale. Additional time has been built into the project timelines to accommodate for the possibility of student worker turnover and difficulty of recruiting student workers outside of standard semester work periods.
  - b. Maintaining a consistent, high-quality digitized product — Prior to starting their digitizing work, students will be given training on the digitizing tools, the NHD database model, and the overall development process. Because of the tedious nature of hand digitizing work, the project timeline is based on 20-hour workweek for student digitizers. It is anticipated that exceeding this 20-hour average would result in a significant decrease in the quality of the digitized product. Student workers will be asked to work at DNR so that DNR technical staff can monitor their work on an on-going basis.
  - c. Loss of DNR technical staff expertise/experience gained in previous NHD pilot project — Four DNR staff members have received at least a limited amount of initial USGS training on NHD development tools and processes. These staff members will participate in additional training in the next few weeks as USGS technical personnel visit DNR to conduct the conflation/post-conflation processes for the initial pilot project and train DNR personnel in those processes. However, one key DNR staff member (Josh Lear) has, at this point, done most of the technical development work on the NHD pilot project and it is his experience that is most critical to this proposed project. Mr. Lear is very supportive of NHD development statewide, he has been actively involved in the development of this specific project proposal, and sees it as a pivotal next step in the effort to develop this database on a statewide basis. The

administration of DNR has committed Mr. Lear's time and support to this proposed project. During the course of this proposed project efforts will be made to broaden the experience of other DNR technical staff on the NHD development process.

- d. Complications related to multiple project partners — The proposed project involves the cooperative efforts of three public agencies coming from three different levels or types of agencies (a regional NRD, a state code agency, and a university division). The risks associated with organizational complexity have been somewhat mitigated by meetings to develop this proposal that have involved the staff and directors of all three agencies. Agency directors have expressed their support for this cooperative endeavor, with consideration for it being a possible pilot for a larger statewide effort. All three agencies are members of the Nebraska GIS Steering Committee, which has endorsed and prioritized this project. Periodic meetings involving representatives of the three agencies will be held to monitor the progress of the project and to address any developing problems.
- e. From scratch digitizing versus editing — The initial Nebraska NHD pilot project was based on editing existing line work representing 1:24,000-scale surface water features. Because 1:24,000 surface water feature line work does not exist for most of Nebraska's geographic area, and for the project area of the Salt Creek Watershed, most of these line work databases will need to be created from scratch based on heads-up digitizing of aerial photography. This will be a change from the NHD pilot project experience and may add complications or require additional digitizing time. The experience of DNR staff, Josh Lear, in editing the existing line work to current aerial photography locations has lead him to believe that it will be as fast or faster to do this digitizing from scratch. Some additional time and resources for digitizing have been built into this proposal to compensation for the possibility that may not prove to be true. In addition, a written request has been sent to USGS to specifically identify the minimum subset of attributes that are needed for digitized line work to work with existing NHD development software tools.
- f. Unanticipated conflation/post-conflation process step complications — At the time that this proposal was being developed, the final stages of the Nebraska NHD pilot project (conflation/post-conflation) has yet to be completed. USGS technical personnel are scheduled to be at DNR to conduct these final NHD development steps and to train DNR personnel in them at the end of February. It is possible that as part of these process steps unanticipated problems will be encountered. However, USGS has committed itself to work with and train Nebraska personnel in these processes, so it can be reasonably assumed that any problems can be worked through.

#### 4. Impact if project is not completed as proposed.

On one level, the failure to complete this project as proposed will mean that agencies needing this type of database for their applications will not have it available, at least in the near term, for this particular watershed area. This means that those applications will either not be able to be pursued or they will be done using lower quality data. For some,



it will probably result in efforts to develop some variant of this database, which will likely not serve the multi-agency, multi-purposes of the NHD database.

On another level, the impact may be more significant. This project proposal is the latest step in a series of cooperative interagency steps to identify and jointly develop commonly needed geospatial data infrastructure. This cooperative effort, under the auspices of the Nebraska GIS Steering Committee, has prioritized for development a standard reference surface water features database. Based on this prioritization, an interagency working group has research database models and recommended the NHD model and an initial cooperative pilot project has been undertaken to explore the resources needed and further develop the guidelines for a Nebraska NHD. This proposed project is another step to further explore developmental approaches and cooperative organizational model that might be applied to a statewide development effort. While it hopefully will not spell the end of the systematic effort to cooperative fill a common data infrastructure need, if this project does not go forward, it will be a set back.

## Section IX: Financial Analysis and Budget

Provide the following financial information:

	CTF Grant Funding	Cash Match (5)	In-Kind Match (6)	Other Funding Sources (7)	Total
<b>Personnel (1)</b>			\$896		\$896
<b>Contractual Services</b>					
• Design			\$6,000		\$6,000
• Programming and Testing					
• Project management, evaluation, and quality assurance	\$1,600		\$2,000		\$3,600
• Other (2)	\$16,000		\$4,600		\$20,600
<b>Capital expenditures (3)</b>					
• Hardware Acquisition	\$4,000				\$4,000
• Software Acquisition	\$3,200				\$3,200
• Network costs					
• Other					
<b>Other Costs</b>					
<b>Telecommunications</b>					
<b>Supplies and materials</b>					
<b>Other operating (4)</b>					
<b>Travel</b>					
<b>TOTAL</b>	\$24,800		\$13,496		\$38,296

**Section IX: Financial Analysis and Budget -- Detail**  
**Creating a Common Framework for Integrating Surface Water Data**

	CTF Grant Funding (hrs.)	CTF Grant Funding (\$)	In-Kind Match (hrs.)	In-Kind Match * (\$)	Total (hrs)	Total (\$)
Proj. coord/mgmt - LPNNRD			20	\$896	20	\$896
<b>Personnel (1)</b>			<b>20</b>	<b>\$896</b>	<b>20</b>	<b>\$896</b>
Digitizing/Editing	640	\$11,000			640	\$11,000
<b>Digitizing Subtotal (2)</b>	<b>640</b>	<b>\$11,000</b>			<b>640</b>	<b>\$11,000</b>
Process & Tools Development - Design			120	\$6,000	120	\$6,000
Hire and train digitizers	100	\$5,000			100	\$5,000
Supervision of digitizers	32	\$1,600			32	\$1,600
Conflation & post-conflation			64	\$3,200	64	\$3,200
<b>Technical/Mgmt. Subtotal (3)</b>	<b>132</b>	<b>\$6,600</b>	<b>184</b>	<b>\$9,200</b>	<b>316</b>	<b>\$15,800</b>
Project mgmt - CSD			20	\$1,000	20	\$1,000
Project mgmt - DNR			20	\$1,000	20	\$1,000
<b>Overall project coord/mgmt (4)</b>			<b>40</b>	<b>\$2,000</b>	<b>40</b>	<b>\$2,000</b>
Computer Hardware		\$4,000				\$4,000
Software		\$3,200				\$3,200
<b>Capital expenditures (5)</b>		<b>\$7,200</b>				<b>\$7,200</b>
Work space for digitizers				\$1,400		\$1,400
<b>Overall Totals</b>		<b>\$24,800</b>		<b>\$13,496</b>	<b>996</b>	<b>\$38,296</b>

- (1) Personnel - \$700 salary and \$196 benefits
- (2) Student Digitizers - contracted through Cons.& Survey Div. - UNL, based on estimate of 2 grad. students working 20 hrs/wk for 4 mths at \$1,100/mth + 25% benefits
- (3) Technical/Proj. Mgmt. Staff - contracted through Dept. of Nat. Resources, based on est. hours at \$50/hr. includes technical personnel, hardware, software, space, etc.
- (4) Overall project coord/mgmt. - est. time required for overall interagency coord/mgmt from agency proj. mgrs & adm.
- (5) Capital Expenditures - relatively high end computer est. \$4,000; ArcGrid software for \$2,000; and ArcInfo seat license \$1,200. This hardware/software will be available for anticipated followup efforts to develop NHD statewide

\* In-kind Match - \$986 from LPNNRD for overall project mgmt/coord.; \$9,200 from DNR for technical services, \$1,000 for proj. coord/mgmt and \$1,400 for digitizer workspace; \$1,000 for CSD proj. coord/mgmt. Each of these will be documented via letter and project timesheets to the extent each of these agencies maintain specific project timesheet accounting.

## **Letters of Support**

Attached letters of support from the following:

Nebraska GIS Steering Committee  
Nebraska Department of Natural Resources  
Conservation and Survey Division - UNL  
Nebraska Department of Environmental Quality  
Lancaster County Commissioners  
Lancaster County/City of Lincoln Planning Department and Public Works and Utilities

Expected letters of support, but not received by grant application deadline (*will deliver when they arrive*):

City of Wahoo  
Saunders County  
Lower Platte South Natural Resources District